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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/591,565	05/07/2007	Joachim Koehler	Umicore 0169-US	6226

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KALOW & SPRINGUT LLP
488 MADISON AVENUE
19TH FLOOR
NEW YORK, NY 10022

EXAMINER	
PARSONS, THOMAS H	

ART UNIT	PAPER NUMBER
1795	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/591,565	KOEHLER ET AL.	
	Examiner	Art Unit	
	THOMAS H. PARSONS	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 May 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *09/01/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Specification

The following guidelines illustrate the preferred layout for the specification of a utility application. These guidelines are suggested for the applicant's use.

Arrangement of the Specification

As provided in 37 CFR 1.77(b), the specification of a utility application should include the following sections in order. Each of the lettered items should appear in upper case, without underlining or bold type, as a section heading. If no text follows the section heading, the phrase "Not Applicable" should follow the section heading:

(a) TITLE OF THE INVENTION.
(b) CROSS-REFERENCE TO RELATED APPLICATIONS.
(c) STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT.
(d) THE NAMES OF THE PARTIES TO A JOINT RESEARCH AGREEMENT.
(e) INCORPORATION-BY-REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC.
(f) BACKGROUND OF THE INVENTION.
(1) Field of the Invention.
(2) Description of Related Art including information disclosed under 37 CFR 1.97 and 1.98.
(g) BRIEF SUMMARY OF THE INVENTION.
(h) BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWING(S).
(i) DETAILED DESCRIPTION OF THE INVENTION.
(j) CLAIM OR CLAIMS (commencing on a separate sheet).
(k) ABSTRACT OF THE DISCLOSURE (commencing on a separate sheet).
(l) SEQUENCE LISTING (See MPEP § 2424 and 37 CFR 1.821-1.825. A "Sequence Listing" is required on paper if the application discloses a nucleotide or amino acid sequence as defined in 37 CFR 1.821(a) and if the required "Sequence Listing" is not submitted as an electronic document on compact disc).

The Examiner suggests amending the application as appropriate to conform to the preferred layout.

1. The disclosure is objected to because of the following informalities:

page 6, line 11, suggest deleting "according to Claims 1" and replacing with --according to the present invention--, or other appropriate text.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 9-10 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential steps, such omission amounting to a gap between the steps. See MPEP § 2172.01. The omitted steps are:

providing a membrane fuel cell stack comprising the membrane electrode units according to any of claims 1 to 6; and,

providing or feeding dry, unhumidified gas to the anode and cathode.

4. Claims 5 and 6 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Regarding claims 5 and 6, the phrase "such as" renders the claim indefinite because it is unclear whether the limitations following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

6. Regarding claim 6, the phrase "for example" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

7. Regarding claim 5, the phrase "in particular" renders the claim indefinite because it is unclear whether the limitation(s) following the phrase are part of the claimed invention. See MPEP § 2173.05(d).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-3 and 5-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1 229 600 (hereafter EP '600) in view of Imahashi et al. (US 5,350,643).

Claim 1: EP '600 in Figures 5 and 10 disclose a membrane electrode unit (17 07 35)for membrane fuel cells, comprising an ion-conducting membrane (15 or 34), at least one anode electrode layer (16 or 33), at least one cathode electrode layer (16 or 33), at least one porous, water repellent gas diffusion layer (11 or 31) mounted on the anode side and at least one porous, water repellent gas diffusion layer mounted on the cathode side (11 or 31)(paragraphs [0003], [0024]-[0025], [0033], [0049]-[0050]),

wherein the total pore volume of the cathode gas diffusion layer is higher than the total pore volume of the anode gas diffusion layer ($V_{Cathode} > V_{Anode}$), (paragraphs [0074]-[0076] and [0039]-[0040]). ***See also entire document.***

EP '600 does not disclose that

the amount of water repellent agent in the anode and the cathode gas diffusion layer is in the range of 20 to 35% by weight (based on the total weight of the gas diffusion layer), and

the amount of water repellent agent in the anode gas diffusion layer is identical or higher than the amount of water repellent agent in the cathode gas diffusion layer ($WRA_{Anode} \geq WRA_{Cathode}$).

Imahashi et al. disclose that the amount of water repellent agent in the anode and the cathode gas diffusion layer is in the range of 20 to 35% by weight (based on the total weight of the gas diffusion layer) (col. 4: 33-41; col. 6: 58-col. 7: 9) and that the amount of water repellent agent in the anode gas diffusion layer is identical or higher than the amount of water repellent agent in the cathode gas diffusion layer ($WRA_{Anode} \geq WRA_{Cathode}$) (abstract and col. 5: 40-43). ***See also entire document.***

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the membrane electrode unit of EP '600 by incorporating the amount of water repellent agent as taught by Imahashi et al.

One having ordinary skill in the art would have been motivated to make such a modification because Imahashi et al. teach an amount of water repellent agent that would have provided a solid polymer electrolyte fuel cell which has, for carrying out the gas diffusion in the hydrogen electrode and the oxygen electrode at a high efficiency, such structure that the transfer of the protons is accelerated at the hydrogen electrode and the flooding of water is inhibited at the oxygen electrode, to thereby improve the contacting efficiency between the catalyst layer of the electrode and the gas and simultaneously promote the oxidation-reduction reaction which takes place at the interface between the electrode and the electrolyte membrane (col. 2: 23-35).

Claim 2: The EP combination does not disclose the total pore volume of the gas diffusion layer on the cathode side ($V_{Cathode}$) is in the range from 1.0 to 2.5 ml/g and the total pore volume of the gas diffusion layer on the anode side (V_{Anode}) is in the range from 0.5 to 2.0 ml/g.

In particular, EP '600 discloses that it is effective that a gas permeability of the conductive porous base material in the cathode is 1.2 to 2.0 times a gas permeability of the conductive porous base material in the anode. And, that it is effective that a porosity of the conductive porous base material in the cathode is 1.2 to 2.0 times a porosity of the conductive porous base material in the anode.

Therefore, it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have modified the total pore volume of the membrane electrode unit of the EP '600 combination to provide a total pore volume as taught by EP '600, in that claimed.

One having ordinary skill in the art would have been motivated to make such a modification because EP '600 teaches a porosity that would have provided an improved polymer electrolyte fuel cell having a high discharge characteristic or more specifically a high current-voltage characteristic in a high current density range by optimizing water repellency, thereby improving the overall performance of the fuel cell (see EP '600, paragraph [0032]).

Claim 3: The rejection is as set forth above in claim 1 wherein Imahashi et al. further disclose that the water repellent agent comprises fluorinated polymers such as PTFE (col. 3: 36-40).

Claim 5: EP '600 discloses that the ion-conducting membrane comprises proton-conducting polymer materials such as tetrafluoro-ethylene/fluorovinyl ether copolymers having acid functions, in particular sulphonic groups (i.e. Nafion 112)(paragraph [0092]).

Claim 6: The rejection is as set forth above in claim 1 wherein EP '600 discloses that the electrode layers comprise catalytically active, finely divided noble metals, such as, for example, platinum (paragraph [0091]). Further, Imahashi et al. disclose that electrode layers comprise of catalytically active, finely divided noble metals, such as, for example, platinum, palladium, ruthenium, gold or combinations thereof (col. 3: 32-36).

Claim 7: EP '600 discloses that the membrane electrode unit further comprising sealing materials (paragraph [0091] and optionally reinforcing materials for gas-tight sealing on installation in membrane fuel cell stacks (paragraph [0112]).

Claim 8: The rejection is as se forth above in claim 1 wherein further EP '600 discloses a membrane fuel cell stack comprising the membrane electrode unit.

10. Claim 4 rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1 229 600 (hereafter EP '600) in view of Imahashi et al. (US 5,350,643) as applied to claim 1 above, and further in view of Köller et al. (US 6,844,286)

EP '600 and Imahashi et al. are as applied, argued, and disclosed above, and incorporated herein.

Claim 4: The EP combination does not disclose that the gas diffusion layers on the anode and/or the cathode side comprise a microlayer with a layer thickness between 5 and 30 micron.

Köller et al. disclose gas diffusion layers on the anode and/or the cathode side comprising a microlayer (col. 2: 3-10 and col. 6: 51-58). Köller et al. disclose that gas diffusion layers are coated with the microlayer to smooth the coarse surfaces of the carbon substrate and to improve the contact of the gas diffusion layers to the catalyst layers. Therefore, it would have been within the skill of one having ordinary skill in the art at the time the invention was made to have selected the appropriate layer thickness, including that claimed, depending upon the coarseness of the substrate and the desired adhesion strength between the substrate and the gas diffusion layer.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the membrane electrode unit of the EP '600 combination by incorporating the microlayer of Köller et al.

One having ordinary skill in the art would have been motivated to make such a modification because Köller et al. teach a microlayer that would have improved the contact between the gas diffusion layers and the substrate thereby improving the overall integrity of the membrane electrode unit and the performance of the fuel cell.

11. Claims 9-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over EP 1 229 600 (hereafter EP ‘600) in view of Imahashi et al. as applied to claim 1 above, and further in view of Iwase et al. (6,245,453).

EP ‘600 and Imahashi et al. are as applied, argued, and disclosed above, and incorporated herein.

Claim 9: The EP '600 combination discloses a process of operating a fuel cell stack with wet, humidified operating gases (paragraph [0115]) comprising a membrane fuel cell stack comprising the membrane electrode unit.

The EP '600 combination does not disclose operating with dry, unhumidified gases.

Iwase et al. disclose a process for operating a membrane fuel cell stack with dry, unhumidified operating gases, and wet gases (col. 12: 19-23 and 34-44 and col. 12: 64-col. 13: 4).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the process of the EP '600 combination by substituting the wet gas with the dry gas of Iwase et al.

One having ordinary skill in the art would have been motivated to make such a modification because Iwase et al. teach operating a membrane fuel cell stack with dry, unhumidified gas that would have provided superior characteristics over all range of current density, and an improvement in the prevention of the dry-up of the electrolyte film (col. 12: 34-44) thereby improving the overall performance of the fuel cell.

Claim 10: The rejection of claim 10 is as set forth above in claim 9 wherein Iwase et al. further disclose that the dry, unhumidified gases comprise hydrogen and oxygen.

Examiner Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to THOMAS H. PARSONS whose telephone number is (571)272-1290. The examiner can normally be reached on M-F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Pat Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Thomas H Parsons/
Examiner, Art Unit 1795

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795